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Ultrabroadband Extreme Ultraviolet and X-ray Entangled Photon Source

Novel light source generates entangled photons in extreme-ultraviolet and soft X-ray ranges, enabling attosecond-scale quantum imaging and advanced sensing applications.

Quantum entanglement, specifically the entanglement of photons, plays a critical role in various applications of quantum technologies such as quantum information science and quantum sensing. While nanophotonic chips have made great strides in producing entangled photons with broad bandwidth and efficient generation rates, there's a pressing need for advancements that can achieve high photon flux in the extreme-ultraviolet (XUV) and soft X-ray (SXR) domains. With these advancements, researchers would have the ability to conduct experiments on an attosecond scale, for which an ultrabroad energy bandwidth for photon entanglement is required.

In answer to these challenges, Purdue researchers have proposed a light source that can produce attosecond entangled photons in the XUV and SXR regimes using two-photon decay in helium or heliumlike ions. This technology paves the way for enhanced entangled photon generation and has applications for the use of XUV/SXR biphotons for quantum imaging and attosecond quantum spectroscopy.

Technology Validation:

Entangled photon generation schemes were proposed in the XUV/SXR regime using helium atoms and heliumlike ions

Advantages:

- Ultrabroad energy bandwidth for generating entangled photons with a wide range of energies

- Attosecond scale time resolution to allow researchers to explore quantum reactions or phenomena

Technology ID
2023-SHIV-70020

Category
Computing/Quantum Technologies

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- May achieve XUV and SXR regimes that have been unattainable with traditional nanophotonic chips

Applications:

- Quantum Imaging

- Attosecond Quantum Spectroscopy

- Quantum sensing tools and technologies

TRL: 2

Intellectual Property:

Provisional-Gov. Funding, 2023-05-16, United States | Utility-Gov. Funding, 2024-05-09, United States

Keywords: Quantum entanglement, entangled photons, XUV, SXR, attosecond, quantum spectroscopy, quantum imaging, quantum sensing, two-photon decay, heliumlike ions, Chemistry and Chemical Analysis, Lasers, Materials and Manufacturing, Nanotechnology, Optics, Photonics, Physics, Spectroscopy